

# University Math Challenge

*March 21, 2022 to April 8, 2022*

## PROBLEM # 2

- (a) Is it possible to multiply the number 101 by some integer  $N_1$  so that their product  $P_1$  is an integer without zeros in its decimal representation?
- (b) Is it possible to multiply the number 1000000001 (eight zeros) by some integer  $M_1$  so that their product  $Q_1$  is an integer without zeros in its decimal representation?
- (c) Is it possible to multiply the number 101 by some integer  $N_2$  so that their product  $P_2$  is an integer without repeated digits in its decimal representation (that is, no digit appears more than once anywhere in  $P_2$ )?
- (d) Is it possible to multiply the number 1000000001 (eight zeros) by some integer  $M_2$  so that their product  $Q_2$  is an integer without repeated digits in its decimal representation (that is, no digit appears more than once anywhere in  $Q_2$ )?

In each case, explain your answer: if it is possible, explain how to find an example with the stated property; if it is not possible, explain in as much detail as possible why it is not possible.

*Direct any questions to  
Grant Lakeland (OM 3226)*

## Rules & Rewards

- Any undergraduate currently enrolled at EIU is eligible to participate.
- Each solution is to be the work of one individual and is to be submitted with the solver's name, year in school, email address, local address, and home address.
- Each solution is to be written or typed and is due in the main Mathematics Department office (OM 3611) by 2:00pm, Friday, April 8, 2022.
- Entries will be judged on the basis of clarity of exposition and elegance of the solution. That is to say, the *explanation* is more important than the answer.
- An award of \$50 will be given for the best solution. In the case of a two-way tie, the award will be evenly split. If there are more than two 'best' solutions, a drawing will be held for the reward. In the case no award is made for this week's challenge, \$50 will be added to the next week's award.
- Names of all solvers will be posted on the Challenge of the Month bulletin board and on the Challenge homepage: <http://www.eiu.edu/math/challenge.php>